# Internal migration in Australia: Does it exacerbate or mitigate regional skills disparities?

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**Abstract:** Why do some regions prosper while others decline and what are the causes for the disparities between brain-rich and brain-poor regions? In the USA, UK and Europe, there is evidence to suggest that regions with an attractive 'people climate' are likely to be able to entice other people, with embodied levels of human capital to move there – thus creating a virtuous cycle of self-sustaining growth. As such, the spatial distribution of the highly educated population may become increasingly concentrated creating disparities between brain-rich and brain-poor regions. Whether or not this phenomenon is occurring in Australia has not, as yet, been investigated.

This research paper thus attempts to explore the issue using, initially, a descriptive approach. Firstly, it examines spatial patterns of Australian residents who have changed their usual place of residence between the census years 2001 and 2006 by analysing the most current Census data - 2006 Census Confidentialised Unit Record Files (CURFS) Microdata to determine which regions experienced inward/outward migration of highly skilled persons. Secondly, it examines the characteristics of brain-rich and brain-poor regions the primary aim being to see if there is prime facie evidence for the existence of these self-sustaining cycles. There are however, likely to be many compounding factors, so whilst this analysis improves our understanding of the link between migration and human capital, it is but a start – with more sophisticated analysis planned for subsequent research.

## Introduction

The demand for skilled labour is increasing worldwide and the mobility of some sectors of the workforce mean that Australia has to compete internationally for scarce skills (APH). In 2008, Australia experienced its biggest annual exodus on record, as reported in the Emigration 2007-2008 report, with 76 923 people permanently leaving the country (Government, 2008). Almost half (48.2%) were in skilled jobs and approximately two-thirds were aged between 25 and 54. New South Wales (40.8%) experienced the largest number of permanent departures followed by Victoria (21.3%) and Queensland (19.9%) (Pink, 2009). Despite these exodus figures, net overseas migration has been a significant driver of Australia's population growth, contributing 65% of Australia's 2008-09 population growth rate (representing 1.4% of 2.1% population rate.

As noted by the Minister for Immigration and Citizenship Senator Chris Evans, these migration figures (both inward and outward) reflect the current global demand for skills and the internationalisation of the labour market (Government, 2008). Formally, migration is defined as the movement of people across a specified boundary for the purpose of establishing a new or semi-permanent residence. Migration can be international (migration between counties) and internal (migration within a country), and it is one of several means by which a household can improve its life chances. Here the household determines the value of place-specific benefits and the various costs of moving to other places before deciding on staying or

moving. As noted by Pekkala (2003), people move if there is a net gain to be made and that an 'optimal' migration choice is one that maximises the difference between the benefits and costs of moving (market and non-market) (Pekkala, 2003).

Evidently, each year tens of thousands of people decide that there is a net gain to be made from moving. Also evident is the fact that highly educated people are particularly mobile. Basker (2002) reports that persons with at least a bachelor's degree now account for 37% of all migrants – even though they comprise just 27% of the population (Basker, 2002). This pattern is also evident for movements within Australia: the ABS Queensland Survey on Mobility, for example, found that:

- Just under three quarters (69.9% or 70,800) of unemployed persons are movers. This contrasts with 44.5% (740,500) of employed persons and 31.8% (267,200) of persons not in the labour force.
- Generally persons with post-school qualifications were more likely to have moved than persons without such qualifications. Over half of persons with bachelor degrees moved (55.2%, 128,500), compared to 38.4% (555,200) of those with post-secondary qualifications.

Not only are the highly educated relatively mobile, but they have established migration patterns: they appear to be more likely to move to urban municipalities than rural areas – perhaps because urban centres offer better job opportunities as well as more versatile possibilities for self improvement, hobbies etc. Professional people are increasingly either choosing to remain in urban and coastal regions or are moving away from regional, rural and remote areas (Miles et al. 2006). As such, rural regions often lose a remarkable part of their highly educated labour to urban regions (RitsilÃ„a and Haapanen, 2003).

Regional disparities in the general skill-level of populations lead to regional disparities in the social and economic development of regions. Skilled shortages can act as a significant barrier to regional economic growth through decreased output and ineffective provision of regional services. In addition, because migrants (movers) are generally younger in age, the nature and structure of regional populations are directly affected: in-migrant regions experience a rejuvenation effect, while regions which lose population are usually subjected to more rapid ageing.

The issue of attracting and retaining skilled people in non-metropolitan Australia is an acknowledged concern of the Australia Government as well as State, Territory, and local governments. Indeed, the Australian SCORD Committee (Standing Committee on Regional Development for the Regional Development Council) reports that:

> *"Attracting and retaining professional and skilled people to live and work within regional communities is one of the major challenges in building sustainable regions. A generic "one size fits all" approach to resolving the difficulties faced by regional communities is unlikely to be successful' (SCORD, 2004).*

A key problem for those interested in promoting regional development is therefore, to determine how best to attract (and retain) skilled people in regional locales.

Pekkala (2003) argues that the young, educated individuals are attracted by higher wages and employment chances. Furthermore, a study by Hansen and Niedomysl (2009) showed that migration rates of the "creative class" are marginally higher than for other groups. The authors argue that most migration activities for the creative class take place just after finishing

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Niedomysl, 2009). This hypothesis has some support from the ABS Queensland Survey on Mobility which found that 20.0% (215,900) of all movers identified better employment prospects as a consideration for moving (Pink, 2009).

However there is ample evidence to suggest that it is not just employment prospects that affect migration decisions. For example, Ph.D graduates have been found to be particularly responsive to amenities when making their location choices, *"the decision about where to love and enjoy life can play as large or a larger role than the job itself in final location decisions"* (Gottlieb and Joseph, 2006). And it seems that some forms of migration can become self reinforcing, as when the 'talented' population itself becomes an amenity that attracts other well-educated migrants. Waldorf (2007), for example, finds that highly educated migrants are disproportionately attracted by the high educational status of current residents, while Gottlieb and Joseph (2006) find that science and technology graduates are especially prone to move to those places having better-educated populations. In addition, Florida's research found positive and significant relationships between (a) the bohemian index (a measure of the proportion of 'creative' people relative to the population as a whole) and concentrations of high human capital individuals and (b) the bohemian index and concentrations of high-tech industry (Florida, 2002).

If these later observations hold true, then it seems that regions with an attractive 'people climate' may be able to entice other people with embodied levels of human capital to move there, thus creating a virtuous cycle of self-sustaining growth. As such regional skills disparities may, over time, become more, rather than less pronounced (contrary to what might be predicted by the theory of factor-price equalisation). Evidently, there are complex interactions between the characteristics of migrants and the characteristics of regions that warrant further consideration.

Nevertheless, it seems that the majority of studies on these topics have been conducted in the USA, UK and Europe (Florida, 2002, Hansen and Niedomysl, 2009, Waldorf, 2009). To the best of the authors' knowledge, no researchers have attempted to confirm or deny whether there is a reinforcing cycle of self-sustaining growth associated with migration in Australia. Moreover, there is a significant body of literature that describes the characteristics of individuals who are, or who are not, likely to migrate from one region to another. And much research has been done that describes the characteristics of regions which attract large numbers of migrants. But relatively little research has been done on the way in which individual and regional characteristics jointly interact to influence migration decisions. Significant research gaps exist – particularly with respect to regional migration in Australia.

This paper seeks to redress at least part of that research gap, taking the first of several planned steps into an investigation of those interactions. Specifically, it uses data on mobility of more than 175,000 individuals to answer two related questions:

1) Where are the 'brain drain' and 'brain gain' regions of Australia?
2) Is there prime facie evidence of the existence of a reinforcing cycle of skilled/unskilled migration?

The analysis is largely descriptive. As such the paper does not produce definitive 'solutions' to the problem of regional skills shortages. But its contribution is, nonetheless important, in that it provides a solid foundation for further research into a vitally important topic. The paper is structured as follows: section 2 describes the methods used to answer the key research questions, including a discussion of the way in which *migration* and *skills*

are measured in this study, and the way in which 'brain-drain' and 'brain-gain' regions were identified; the results of the study are discussed in Section 3 and the implications of these findings are addressed in Section 4.

Before continuing, however, it is worth acknowledging the fact that there is a wide body of literature that seeks to (appropriately) define the concept: *region* (Boudeville, 1966, Committee, 2001, Coombs, 2001, Sorensen, 2002, Howard, 2003, Topaloglou *et al.*, 2005, OECD, 2009). This paper does not contribute to that literature. Instead, it takes as given, the Australian Bureau of Statistics' (ABS) definition of a 'region' – not for academic or scientific reasons, but for pragmatic reasons: it is the ABS's census data that is used in this investigation, so it is the ABS's regions that define our geographic boundaries.

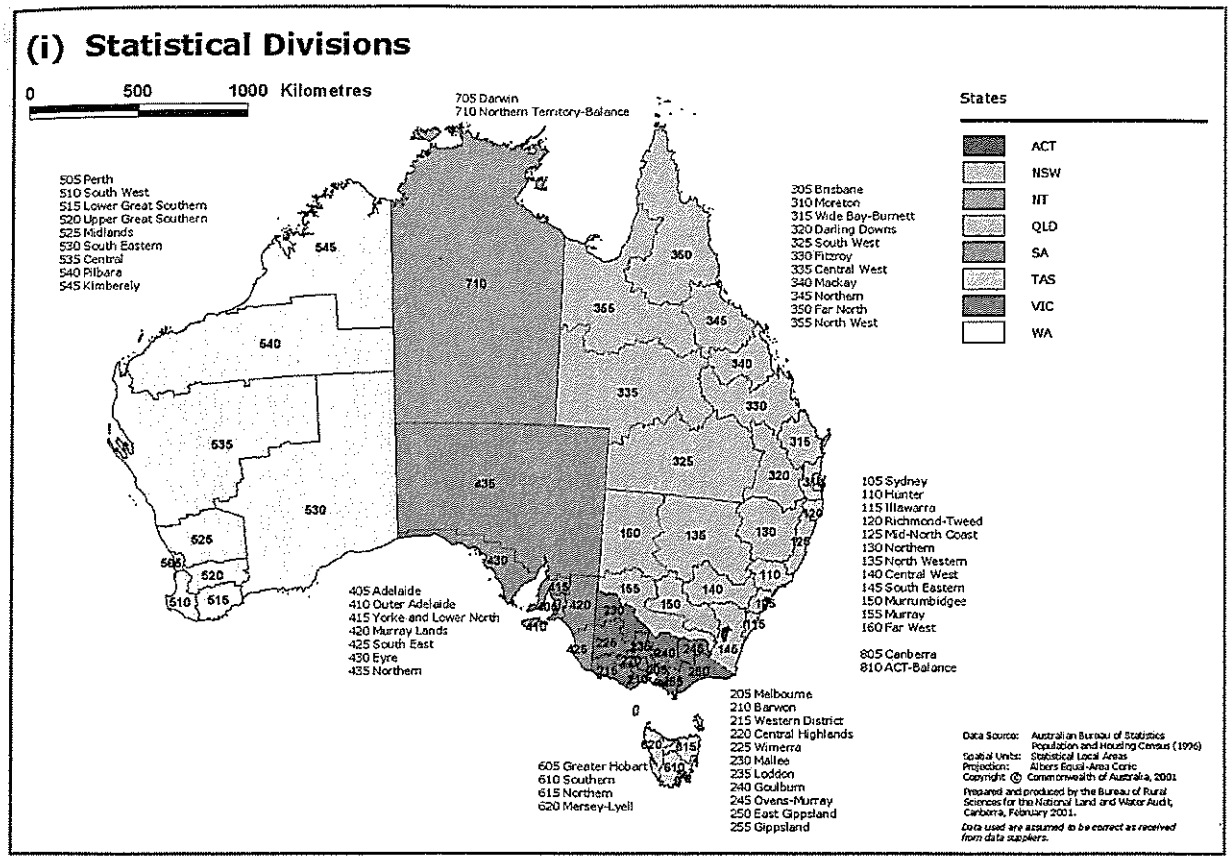
It is also worth briefly digressing to consider the terms 'brain drain' and 'brain gain'. There is clearly no universally accepted and unbiased measure of the intelligence of an individual, much less of a region. As such, it is not possible to accurately measure – let alone compare – the 'brainiess' of regions. Yet as alluded to in the foregoing discussion, the primary social problem that this research seeks to redress is that of regional skills shortages. And it is on the 'skills' (proxied here, by education – as discussed below) of both regional migrants and residents that our paper focuses. So a region referred to in this paper as having 'brain gain' is one in which the skill-level of the population is deemed to be increasing as a result of net migration; regions identified as suffering from 'brain drain' are those where the skills of the population seem to be decreasing as a result of net migration. The details of those calculations are discussed in more depth in the following section.

**Methodology**

The research described in this paper uses data from the Australian Bureau of Statistics (ABS) 2006 Census Confidentialised Unit Record Files (CURF) Microdata at the 1% Basic Census Sample File (CSF)[1] . The dataset contains responses to the ABS Census survey conducted on 8th August, 2006 and is the most detailed data product available from the ABS. The 1% Basic CSF file contains data on 81,221 dwellings, 87,071 families and 199,406 persons in 48 separate formally defined regions. These geographic regions are Statistical Regions (SRs), or aggregates of SRs, as defined in the ABS publication Statistical Geography: Volume 1 – Australian Standard Geographical Classification (ASGC), Jul, 2006, (cat. no. 1216.0)2. Responses from overseas visitors, or from those who indicated 'no usual address' and 'not stated/not applicable' were removed from the master set leaving a total of 161,674 observations for our analysis.

Figure 1 below produces a map of all the statistical divisions across Australia. The regions available in our Microdata are more aggregated to comply with confidentiality.

**FIGURE 1: Statistical Divisions in 2001**




Source: the Australian Natural Resources Atlas, 2001

## Developing proxies for key variables

### *Measuring human Capital*

Although the popular press most often uses terms such as 'skilled' and 'unskilled', in economics, it is more common to discuss the concept of human capital. Formally, human capital is the investment that people make to improve their productivity. In Adam Smith's (1776) Classical Inquiry into the Nature and Causes of the Wealth of Nations he describes 'education as an investment to increase future income' (Smith, 1776/1976)i.

To date, most empirical studies have used some measure of educational experience as a proxy for human capital including, for example, education-augmented labour input, adult literacy rates, school enrolment ratios and average years of school (Schultz, 1960, Barro and Lee, 1996, Wossmann, 2003), the share of people (or share of workforce) who hold a college degree or bachelor degree, or some other measure of educational attainment (Glaeser, 1994). Similarly, Romer and Weil (1992) used the fraction of the working-age population attending secondary school as a measure of human capital investment at any point in time (Romer, 1990).

Following the lead of others, this paper thus uses education as a proxy for 'skill', formally identifying any person with a bachelors degree or higher as 'skilled'[3]. To be more specific, our dummy variable representing Human Capital (*'Skilled'*) was constructed from responses to the census question relating to 'Non-School Qualification: Level of Education (QALLP)'. This variable describes the level of a person's highest completed non-school qualification (applicable to persons aged a 15 years and over) and 'Highest Year of School Completed' (HSCP), which contains the highest level of primary or secondary schooling completed.

Tables 1 and 2 show the categories (values) provided by these variables for the data set use in this paper.

**TABLE 1: Number of respondents with different post-school qualifications**

| *Level of education* | *N* | *%* |
|---|---|---|
| Postgraduate Degree Level | 3318 | 2.1 |
| Graduate Diploma and Graduate Certificate Level | 2138 | 1.3 |
| Bachelor Degree level | 16086 | 9.9 |
| Advanced Diploma and Diploma Level | 10160 | 6.3 |
| Certificate Level | 25028 | 15.5 |
| Level of education inadequately described | 2054 | 1.3 |
| Level of education not stated | 9007 | 5.6 |
| Not applicable | 93883 | 58.1 |
| Total | 161674 | 100.0 |

**TABLE 2: Highest year of school completed**

| *Highest Year of School* | *N* | *%* |
|---|---|---|
| Year 12 or equivalent | 59980 | 37.1 |
| Year 11 or equivalent | 14950 | 9.2 |
| Year 10 or below (includes Did not go to school) | 56925 | 35.2 |
| Not Stated | 6580 | 4.1 |
| Not applicable | 23239 | 14.4 |
| Total | 161674 | 100.0 |

From these two variables a dummy variable (skilled) was constructed where skilled = 0 represents an unskilled person and skilled = 1 represents a skilled worker.

***Identifying migrants***

Our migration variable measures what is formally referred to by the ABS as 'Population Mobility' which is 'the geographic movement of people [defined as] a change in the place of usual residence" (Doyle, 2000). To be more specific, our measure of population mobility is constructed by comparing the place of usual residence of each individual within the CURF data set at the time of the 2006 census (REGUCP) with that individual's usual residence five years earlier(REGUC5P).

To be even more specific, a dummy variable (*Mover)* was constructed as follows:

$$Stayer = 0, \quad no\ difference\ between\ REGUCP\ and\ REGUC5P$$

$$Mover = 1, \quad a\ difference\ between\ REGUCP\ and\ REGUC5P$$

*Identifying skilled migrants*

The two dummy variables for human capital and migration were then combined to categorise each individual within the database according to their 'skill' and their mobility:

$$\begin{aligned} Skilled\ Stayer = 1,\ & if\ (mover = 0\ and\ skilled = 1) \\ Skilled\ Mover = 2,\ & if\ (mover = 1\ and\ skilled = 1) \\ Unskilled\ Stayer = 3,\ & if\ (mover = 0\ and\ skilled = 0) \\ Unskilled\ Mover = 4,\ & if\ (mover = 1\ and\ skilled = 0) \end{aligned}$$

Before continuing it should be noted that the particular processes used for defining skilled and unskilled migrants from this data set are not flawless. As such, when interpreting results from this analysis, care will have to be taken to ensure that the data limitations are considered. Specifically, 'population mobility' only allows one to determine whether a person has moved between two points in time. But it is not possible to determine how many times that person has moved within that period of time. Furthermore, the data only allows one to identify persons who have moved from one statistical region to another. Statistical regions (based on 124,000 persons) can be geographically large in rural and remote regions, so it may not be possible to identify some persons who have moved long distances.

The importance of this later point is illustrated in the map presented in the section above (taken from the Australian Natural Resources Atlas in 2001). While it is not a precise representation of the current statistical division boundaries (for the recent 2006 census data) the map is still able to illustrate the issues discussed. For example, for the 2006 CSF CURF data the Northern Territory is represented by only one statistical Division, (basically the State) amalgamating Darwin (105,991 persons) and the Northern Territory Balance (84,907 persons). While it represents 190,898 persons, it also covers 1,352,176 kilometres. Compare this to another Statistical Division such as that of Far North in Queensland, it has a similar population size (231,051 persons) yet its coverage, 273,161 kilometres, is one-fifth of that for the Northern Territory region.

**Identifying brain-drain and brain-gain regions**

As noted in the introduction, a region is deemed to be experiencing 'brain gain' if the skill-level of the population is rising as a result of net migration; regions suffering from 'brain drain' are those where the skills of the population are decreasing as a result of net migration.

In this paper, data relating to each individual were used to calculate in-ward and out-ward and net migration of skilled/unskilled persons for each of the 48 regions used by the ABS in the 1% unit record files. Specifically, for each region, *i*, the number of:

a) In-migrants were calculated by adding the number of persons who were residents of region *i* during 2006, but not during 2001;
b) Out-migrants were calculated by adding the number of persons were NOT residents of region *i* during 2006, but had lived there during 2001; and
c) Net migrants were calculated by subtracting the number of out-migrants from the number of in-migrants.

These migrants were classified according to whether or not they were skilled, or otherwise, and the ratio of (net) skilled to (net) total migration was calculated for each region: $S_M / T_M$.

Loosely speaking: if the average skill level of migrants ($S_M/T_M$) is greater than the average skill level of the resident population ($S_R / T_R$, where $S_R$ = number of skilled residents and Tr = total number of residents), then migration is making a positive contribution to the region's skills In contrast, if the average skill level of migrants is less than that of the population at large, then migration is serving to reduce the region's skill-set. The issue is, however, somewhat more complex than that, since each region sees both in and out migrants. As such, $S_M$ and $T_M$ can be either positive or negative, so one cannot simply calculate these ratios, and compare. Indeed there are four possible scenarios:

1. $T_M$ positive: $S_M$ also positive (*Population gain; uncertain impact on human capital).*

   These regions are growing (evidenced by the fact that $T_M$ is positive, and assuming that natural declines in the population – through deaths – do not exceed $T_M$). These regions will be experiencing an increase in the quality of human capital if the share of net skilled migrants in total net migration ($S_M / T_M$) exceeds the existing share of skilled persons in total regional population ($S_R / T_R$); otherwise the quality of human capital will be falling as a result of migration flows.

2. $T_M$ positive: $S_M$ is negative (*Population gain; unambiguous decline in human capital – so brain drain region)*

   As in case (1), these regions are growing. But because $S_M$ is negative, we know that the region is, unambiguously, experiencing a decline in the quality of its human capital (the skilled people are leaving, and being replaced with the un-skilled)

3. $T_M$ negative: $S_M$ positive (*Population loss; unambiguous rise in human capital – so brain gain region).*

   In contrast to the cases above, these regions are experiencing net decreases in population as a result of migration (although it is possible for the number of births to exceed TM). Nevertheless, because $S_M$ is positive, we know that the region is, unambiguously, experiencing an increase in the quality of its human capital (since every person moving into the region is skilled, whereas those leaving may be either skilled or unskilled).

4. $T_M$ negative: $S_M$ also negative (*Population loss; uncertain impact on human capital).*

   As in case (3) the net impact of migration is to decrease the population of these regions. What impact that has upon the average skill-level of the region depends upon the 'quality' of that outflow. If $S_M / T_M > S_R / T_R$ then the average skill level of those who leave the region is greater than the average skill level of the residents, indicating that the average skill level of residents must be falling. If $S_M / T_M < S_R / T_R$, the quality of human capital will be rising as a result of migration flows.

## Results

Of our sample of 161,674 respondents, there is a significant difference between the mobility of skilled and unskilled persons which is consistent with other researchers (Basker, 2002). Skilled persons, that is those who held a Bachelor degree or higher, represented just 13%

(21,542) of all persons but 20% of all movers, and almost a quarter (24%) of all skilled persons moved changed their usual residence between 2001 and 2006 (Table 3). This compares to 14% of unskilled persons who changed residence.

Moreover, the difference between the propensity of skilled and unskilled people to migrate is statistically significant (Pearson Chi-square) at the 0.05 level ($x^2\,(1) = 1235.81,\ p = 0.000$). Evidently, skilled persons are more likely to move than the unskilled. A Queensland Survey on Mobility by the ABS further supports this, which found that over half of persons with bachelor degrees moved (55.2%, 128,500), compared to 38.4% (555,200) of those with post-secondary qualifications (Pink, 2009).

**Table 3: the skills of movers and stayers**

| | Not Skilled | Skilled | Total |
|---|---|---|---|
| Stayer | 119851 | 16407 | 136258 |
| | 88% | 12% | 100% |
| | 86% | 76% | 84% |
| Mover | 20281 | 5135 | 25416 |
| | 80% | 20% | 100% |
| | 14% | 24% | 16% |
| Total | 140132 | 21542 | 161674 |
| | 87% | 13% | 100% |
| | 100% | 100% | 100% |

As shown in Table 4, the 48 regions included in the sample, could be categorised into each of the four groups identified above – some clearly identifiable as being 'brain drain' and 'brain gain' regions (those in category 2 or 3). As noted earlier, however, if one wishes to determine the impact of migration on the stock of human capital for those regions listed in either category 1 or 4, one needs to compare the skill levels of migrants with those of the residents. For category 1 regions, the stock of human capital will be rising if $S_M / T_M > S_R / T_R$; for category 4 regions, the stock of human capital will be falling if $S_M / T_M > S_R / T_R$. The regions listed in table 4, have been placed in order – those at the top of each column have the highest $S_M / T_M$ ratios. Evidently, the stock of human capital in the Australian Capital Territory (ACT) and in Goulburn-Ovens-Murray and All Gippsland (VIC) is rising rapidly; whilst the stock of human capital in Brisbane City Outer Ring (QLD) is falling rapidly.

**Table 4: Classification of Australian Statistical Regions**

| 3. Population falling; human capital increasing (4) | 1. Population rising - ambiguous impact on human capital (19) | 4. Population falling; [illegible] human capital (7) | 2. [illegible] human capital (5) |
|---|---|---|---|
| •Outer South Western Sydney and Inner Western Sydney (NSW) | •Australian Capital Territory (ACT) | •Brisbane City Outer Ring (QLD) | •Mackay-Fitzroy-Cent West (QLD) |
| •Outer Eastern Melbourne (VIC) | •Goulburn-Ovens-Murray and All Gippsland (VIC) | •Southern Adelaide (SA) | •Northern-North Wes and Far North (QLD) |
| •Northern Adelaide (SA) | •Northern and Western SA and Southern and Eastern SA (SA) | •South East Metropolitan (WA) | •Central and East Metropolitan (WA) |
| •Southern Melbourne (VIC) | •Inner Melbourne (VIC) | •Inner Eastern Melbourne (VIC) | •South and East BSD Balance (QLD) |
| | •Tasmania (TAS) | •Central West and Murray-Murrumbidgee (NSW) | •South West Metropolitan (WA) |
| | •Lower Western WA (WA) | •North Eastern Melbourne (VIC) | •Central Highlands-Wimmera and Lodde Mallee (VIC) |
| | •Brisbane City Inner Ring (QLD) | •Remainder-Balance WA (WA) | •North Metropolitan (WA) |
| | •Central Northern Sydney (NSW) | •Inner Sydney and Eastern Suburbs (NSW) | •Western and Eastern Adelaide (SA) |
| | •South Eastern Melbourne and Mornington Peninsula (VIC) | •Canterbury-Bankstown (NSW) | |
| | •Barwon-Western Districts (VIC) | •Northern and Far West-North Western (QLD) | |
| | •Illawarra and South Eastern (NSW) | •Fairfield-Liverpool (NSW) | |
| | •Gosford-Wyong (NSW) | •Lower Northern Sydney and Northern Beaches (NSW) | |
| | •Sunshine Coast and West Moreton (QLD) | •Northern Territory (NT) | |
| | •Gold Coast (QLD) | •Central Western Sydney (NSW) | |
| | •Hunter (NSW) | •North Western Melbourne (VIC) | |
| | •North BSD Balance and Ipswich City (QLD) | •North Western Sydney (NSW) | |
| | •Wide Bay-Burnett and Darling Downs-South West (QLD) | •St George-Sutherland (NSW) | |
| | •Richmond-Tweed and Mid-North Coast (NSW) | | |
| | •Outer Western Melbourne (VIC) | | |

Even within these groupings, we were unable to rank regions in terms of the way migration has affected the stock of human capita. Therefore, in order to do this we estimated the change in human capital resulting from migration as (hereafter termed a 'change in Human Capital Index'):

$$\Delta HC_{2006} = \left[\frac{Skilled_{2006}}{UnSkilled_{2006} + Skilled_{2006}}\right] \quad \left[\frac{Skilled_{2006} - NSM}{UnSkilled_{2006} + Skilled_{2006} - NTM}\right]$$

Table 5 has the results for each region, comparing them to the existing stock of Human Capital.

**Table 5: Change in Human Capital Index and Human Capital Status**

| Region | Change in Human Capital Index | Region Human Capital Stock ($S_R$ / $T_R$) |
|---|---|---|
| Sunshine Coast and West Moreton | 1.4% | 8.0% |
| Australian Capital Territory | 0.9% | 24.0% |
| Lower Western WA | 0.7% | 7.0% |
| Outer South Western Sydney and Inner Western Sydney | 0.7% | 18.0% |
| South Eastern Melbourne and Mornington Peninsula | 0.6% | 8.0% |
| Outer Eastern Melbourne | 0.6% | 11.0% |
| Goulburn-Ovens-Murray and All Gippsland | 0.5% | 7.0% |
| Northern and Western SA and Southern and Eastern SA | 0.5% | 20.0% |
| Southern Melbourne | 0.5% | 22.0% |
| Inner Sydney and Eastern Suburbs | 0.5% | 25.0% |
| Central Western Sydney | 0.4% | 7.0% |
| St George-Sutherland | 0.4% | 16.0% |
| Northern Adelaide | 0.3% | 7.0% |
| Barwon-Western Districts | 0.3% | 9.0% |
| Gold Coast | 0.3% | 9.0% |
| Lower Northern Sydney and Northern Beaches | 0.3% | 15.0% |
| Brisbane City Inner Ring | 0.3% | 25.0% |
| Inner Melbourne | 0.3% | 33.0% |
| Gosford-Wyong | 0.2% | 7.0% |
| North Western Sydney | 0.2% | 7.0% |

| Region | Change in Human Capital Index | Region Human Capital Stock ($S_R / T_R$) |
|---|---|---|
| Illawarra and South Eastern | 0.2% | 10.0% |
| Tasmania | 0.2% | 10.0% |
| Northern Territory | 0.1% | 6.0% |
| Hunter | 0.1% | 9.0% |
| North Western Melbourne | 0.1% | 10.0% |
| Central Northern Sydney | 0.1% | 24.0% |
| Northern-North West and Far North | -0.1% | 7.0% |
| Wide Bay-Burnett and Darling Downs-South West | -0.1% | 7.0% |
| Richmond-Tweed and Mid-North Coast | -0.1% | 8.0% |
| Outer Western Melbourne | -0.1% | 12.0% |
| North BSD Balance and Ipswich City | -0.2% | 7.0% |
| Brisbane City Outer Ring | -0.2% | 10.0% |
| North Eastern Melbourne | -0.2% | 12.0% |
| Mackay-Fitzroy-Central West | -0.2% | 13.0% |
| Central West and Murray-Murrumbidgee | -0.3% | 14.0% |
| Central Highlands-Wimmera and Loddon-Mallee | -0.4% | 7.0% |
| Central and East Metropolitan | -0.4% | 9.0% |
| Northern and Far West-North Western | -0.4% | 9.0% |
| South West Metropolitan | -0.4% | 17.0% |
| Western and Eastern Adelaide | -0.4% | 17.0% |
| Southern Adelaide | -0.5% | 15.0% |
| Inner Eastern Melbourne | -0.5% | 27.0% |
| Canterbury-Bankstown | -0.6% | 7.0% |
| North Metropolitan | -0.6% | 8.0% |
| South East Metropolitan | -0.6% | 12.0% |
| Remainder-Balance WA | -0.7% | 12.0% |
| South and East BSD Balance | -0.7% | 12.0% |
| Fairfield-Liverpool | -0.7% | 24.0% |

*Source:* Calculated from ABS CDATA

A subset of regions were then selected for subsequent analysis, the main aim being to ensure that the subset included: both brain-drain and brain-gain regions; regions from different jurisdictional States; and the regional centres of Townsville (in which JCU is located) and Newc stle (Table 6).

**Table 6: Brain Gain and Brain Drain Regions**

| | BRAIN GAIN | BRAIN DRAIN |
|---|---|---|
| Net inward migration | *Australian Capital Territory*<br>*Barwon-Western District*<br>*Goulburn-ovens-Murray and All Gippsland*<br>*Hunter*<br>*Lower Western WA* | *Central Highlands-Wimmera and Loddon-Mallee*<br>*Mackay-Fitzroy-Central West*<br>*Northern-North West and Far North* |
| Net outward migration | *Outer South Western Sydney and Inner Western Sydney*<br>*Northern Territory* | *Fairfield-Liverpool* |

The data presented in Table 5 lends support to previous research which has shown that the stock of Human capital, can act as a 'pull' factor to entice people who hold similar embodied levels of human capital to move there (Waldorf, 2009) – as illustrated with reference to our case-study regions.

Firstly, the Australian Capital Territory has both the highest average resident skill level (24% of the resident population), and the highest average migrant skill-level. '*Outer South Western Sydney and Inner Western Sydney*' and '*Northern Territory*', experienced outward migration and increases in the quality of their Human Capita. Interestingly, both of these regions also exhibit relatively high levels of Regional Human Capital Stock - with 13.9% and 9.3% of their populations being 'skilled'. Evidently, those who choose to leave these regions are the un-skilled.

As might have been expected, the region with the lowest average resident skills (Fairfield Liverpool, with just 6.6% of the population having a degree or higher) experienced an overall population decline - with the highly skilled leaving at a faster rate than the unskilled. Interestingly, Table 7 (below) shows that Fairfield-Liverpool had a relatively high unemployment rate for 2006 (9%) which may also help to explain the loss in human capital: as noted earlier, researchers have shown that accessibility to employment opportunities can drive migration.

Similarly, other brain drain regions, *Mackay-Fitzroy-Central West, Central Highlands-Wimmera and Loddon-Mallee and Northern-North West and Far North* all exhibited low levels of human capital stock with just 6.6%, 8.7% and 8 % of their population holding degrees or higher (compared to the Australian average of 12%. In addition their unemployment rates were relatively low, possibly indicating that of those jobs which were created they have attracted "unskilled' persons. This observation can be further assessed through comparisons of the regions' occupation cohorts (Table 8).

To be more specific, 'Mangers' and 'Professionals' were highest (collectively) in our Brain –Gain regions *'Australian Capital Territory'* (24%) and *'Outer South Western Sydney and Inner Sydney'* (19%). The lowest level was in brain-drain region Fairfield-Liverpool (at 8% collectively).

Further unsurprisingly our brain-drain regions 'Mackay-Fitzroy-Central West' (12%), Northern-North West and Far North (10%) and Fairfield-Liverpool (10%) all exhibited higher levels of occupations as 'Machinery Operators and drivers' and 'Labourers', collectively.

An important observation to make that one of our brain-gain regions, *'Lower Western WA'*, did not have a high human capital stock (6.8%) and it can be seen now that it also contains a high proportion of workers employed as 'Machinery Operator and Drivers' and 'Labourers' (10% collectively). One would expect that the Human Capital Stock and Occupation variables to be correlated. In subsequent research other variables such as income and the bohemian index (Florida, 2002) will be incorporated into our analysis to explore these importance of these economic and social factors to migration. Florida (2002) points out measures of human capital which only use educational status are too narrow – and highlights the importance of creative mindsets to growth and prosperity in region.

**Table 7: Unemployment rates in Brain Gain and Brain Drain Regions**

| Region | Unemployment Rate |
|---|---|
| | *Brain Gain* |
| Australian Capital Territory | 3% |
| Barwon-Western District | 6% |
| Goulburn-Ovens-Murray and All Gippsland | 6% |
| Hunter | 7% |
| Lower Western WA | 4% |
| Outer South Western Sydney and Inner Western Sydney | 4% |
| Northern Territory | 4% |
| | *Brain Drain* |
| Central Highlands-Wimmera and Loddon-Mallee | 6% |
| Mackay-Fitzroy-Central West | 4% |
| Northern-North West and Far North | 4% |
| Fairfield-Liverpool | 9% |
| **Australia** | **5%** |

**Table 8: Occupation Cohorts**

| | Managers | Professionals | Technicians &Trades Workers | Community & Personal Service Workers | Clerical & Administrative Workers | Sales Workers | Machinery Operators And Drivers | Labourers |
|---|---|---|---|---|---|---|---|---|
| **Brain Gain** | | | | | | | | |
| Australian Capital Territory | 8% | 16% | 6% | 5% | 10% | 4% | 1% | 3% |
| Barwon-Western District | 7% | 7% | 7% | 4% | 5% | 5% | 3% | 6% |
| Goulburn-Ovens-Murray and All Gippsland | 7% | 6% | 7% | 4% | 5% | 4% | 3% | 6% |
| Hunter | 5% | 7% | 7% | 4% | 6% | 4% | 3% | 5% |
| Lower Western WA | 7% | 6% | 8% | 4% | 5% | 4% | 4% | 6% |
| Northern Territory | 6% | 8% | 7% | 6% | 7% | 3% | 3% | 5% |
| Outer South Western Sydney and Inner Sydney | 7% | 13% | 6% | 4% | 8% | 4% | 3% | 4% |
| **Brain Drain** | | | | | | | | |
| Mackay-Fitzroy-Central West | 6% | 6% | 9% | 4% | 6% | 4% | 6% | 6% |
| Central Highlands-Wimmera and Loddon-Mallee | 7% | 7% | 6% | 4% | 5% | 4% | 3% | 6% |
| Northern-North West and Far North | 6% | 7% | 8% | 5% | 6% | 4% | 4% | 6% |
| Fairfield-Liverpool | 3% | 5% | 6% | 3% | 6% | 4% | 5% | 5% |
| | | | | | | | | |
| **Australia** | **6%** | **9%** | **7%** | **4%** | **7%** | **5%** | **3%** | **5%** |

## Discussion

Research has shown that the highly educated are relatively mobile, increasingly selecting to remain in city and coastal regions or moving away from region, rural and remote areas. There is also evidence to suggest that the educated stock of the population in itself becomes an amenity that attracts other well educated migrants. As such disparities between rural and urban regions continue to widen as the highly educated migrants choose to move to brain-rich regions.

The two main objectives of this paper were to firstly determine the regions which experienced inward/outward migration of highly skilled persons through observing Australian residents who changed their usual place of residence between the census years 2001 Census data - 2006 Census and secondly, to explore the hypothesis that the highly educated stock take on an amenity effect, pulling those with similar embodied human capital levels to the region.

Although our research was largely descriptive, there was some prime facie evidence for the existence of this self-sustaining cycle. Three of our brain gain regions which had high average migrant skill levels of human capital also exhibited high levels of Regional Human Capita. Further these regions held the highest proportion of 'Mangers' and 'Professionals' in their population, which is not surprising, as one would expect these two variables of Human Capital Stock and Occupation to exhibit some correlation. This relationship was present in one of our brain-gain regions, *'Lower Western WA'*, which exhibited a relatively low human capital stock (6.8%) and a high proportion of workers employed as 'Machinery Operator and Drivers' and 'Labourers'.

Similarily, in our brain-drain regions *Mackay-Fitzroy-Central West, Central Highlands-Wimmera and Loddon-Mallee and Northern-North West and Far North* they each exhibited low levels of human capital stock and higher levels of the population employed in occupations as 'Machinery Operators and drivers' and 'Labourers'. Further, these regions all exhibited low unemployment rates which may suggest that of all the jobs that have been created they have largely attracted the unskilled. The brain-drain region with the lowest average resident skills (Fairfield Liverpool) also had the highest unemployment rate for 2006 (9%) which sheds some light onto the loss in human capital: as noted earlier, researchers have shown that accessibility to employment opportunities can drive migration (Pekkala, 2003).

Nonetheless there are clearly many drivers that influence migration and these reasons will differ amongst different types of people, including that of our skilled and unskilled persons. Skill shortages in our regional communities is a growing concern for the government as these shortages act as significant barriers to the social and economic development of the region and thus warrant further research.

Whilst this paper does not produce definitive solutions to the problem of regional skills shortages it has provided a solid foundation for further research which will look into an array of social, economic and environmental factors. As it is not one single factor, such as wages or human capital stock, but rather an interplay of many compounding factors. Thus our subsequent research aims to investigate the determinants of migration by developing an empirical model, which utilises the data established from this research paper methodology, to include both the personal characteristics of the migrant and the characteristics of the region to which it moved to and from.

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[1] A 1 in 100 sample of occupied private dwellings along with the occupants of those dwellings and a 1 in 100 sample of people from Non-private dwellings along with the associated dwelling

[2] The SRs used in the CURF data are based on a minimum of 250,000 persons (except Northern Territory which has a total population of 220,000) to comply with confidentiality. Other Territories- comprising Jervis Bay, Cocos (Keeling) and Christmas Islands and Migratory, shipping and off-shore Census districts have been excluded.

[3] It was decided not to limit the measurement to the workforce as we wanted to represent human capital as a resource to which the region could drawn upon at any given time. For example, someone may be highly educated and not in the workforce however can still provide services to the region in the form of community voluntary services provided in Museums, Board of Directors or future employing jobs.